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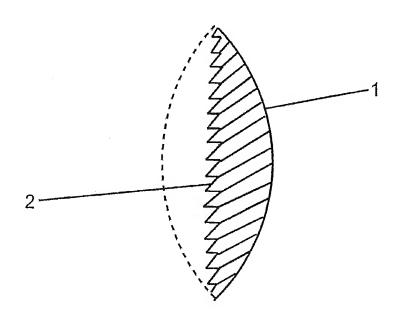
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[Continued on next page]

(54) Title: INTRAOCULAR LENS



(57) Abstract: An intraocular lens comprises, as one face thereof, a Fresnel prism. Such a lens can be used for the treatment of a macular condition requiring a change of focus, e.g. age-related macular degeneration.

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before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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#### INTRAOCULAR LENS

#### Field of the Invention

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This invention relates to an intraocular lens (IOL), and in particular to an intraocular lens that can be used to reduce the effects of age-related macular degeneration (ARMD).

#### Background of the Invention

The treatment of focal macular diseases, and in particular ARMD, represents a major problem. Since the intact macula provides the vision that is required for reading, driving etc (but not for peripheral vision), the fact that there is no effective treatment for its degeneration means that many people increasingly retain peripheral vision only.

In order to solve this problem, it has been proposed that the retina should be moved. A more practical solution is to move the image from the macula to a point on the retina where there are healthy cells; although these cells may not function as well as the macular cells, an adequate degree of vision may be retained. Among other things, this is proposed in US-B-6197057.

In particular, each of Figures 25, 27, 31 and 33 of US-B-6197057 discloses a supplemental lens, i.e. an intraocular lens that is provided in addition to the natural, crystalline lens or to a biconvex IOL. All these drawings show a supplemental lens that is a conventional prism. The consequence is that the image is moved, away from the macula. Elsewhere in the specification, it is suggested that a Fresnel lens should be used as the supplemental IOL (column 9 line 13), and also that the lens should be "fresnel-shaped" (claim 14; again, this is in the context of a supplemental lens). It is unclear what form the "fresnel-shaped" lens should take.

#### Summary of the Invention

The present invention is based at least in part on the realisation that, while the treatment of ARDM requires removal of the crystalline lens, the focusing power of the IOL that is used instead can be provided by a conventional lens, while that same lens can be modified so that light is focused on a (healthy) part of the retina that is not the macula. The present invention takes account of the fact that it would be undesirable to use a prism for this purpose, since that

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would be unnecessarily bulky, and accepts that a Fresnel prism would not normally be used because of image degradation; the latter is a factor of relatively little importance if the macula is anyway degraded. According to the present invention, an intraocular lens comprises, as one face thereof, a Fresnel prism.

The novel lens provides the necessary features within a single unit. It is therefore easier to use and less bulky than any known IOL having the same function. It can be thin and light. Although it will degrade the image, this is a minor disadvantage and, in any case, the retina may not have good resolution. Description of the Invention

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The invention will now be illustrated by way of example only with reference to the accompanying drawing which is a schematic cross-sectional view of a lens embodying the present invention. The lens comprises what is essentially one half of a conventional lens, having a curved surface 1, and an opposed surface 2 in the form of a Fresnel prism.

A lens of the invention may be of conventional size and may be made of any suitable material. General characteristics of such lenses are known. The novel lens may be made of a rigid or hydrophilic material. Suitable materials are those used for intraocular lenses and include both hydrophobic and hydrophilic polymers containing acrylate and methacrylate such as polymethyl methacrylate, and silicone elastomers such as dimethylsiloxane.

If necessary or desired, a lens of the invention may include one, two or more haptics. As is known, they may be attached to the body of the lens at its perimeter, and may extend radially or tangentially.

A lens of the invention will usually have only one power. A range of lenses may be produced, each having a different power. Alternatively, "piggy-backing" may be used, by the provision of a supplemental lens that changes the power of a lens according to the invention.

The novel lens may be used in the eye, in either orientation, but it is generally preferred that a smooth face should face the posterior capsule. That face of the lens having the Fresnel prism may be made smooth, by covering it with a translucent material (to the extent shown by the dotted line in the drawing).

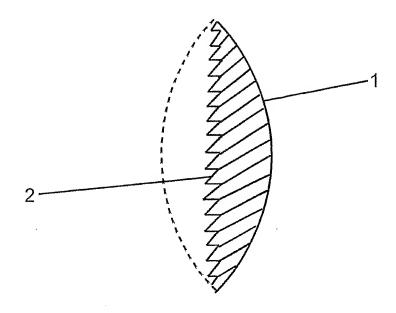
The Fresnel prism component itself may have any of a variety of suitable designs. These include planar (flat disc), cylindrical (curved disc) and spherical (meniscus disc).

A lens of the invention may be used, following removal of the crystalline lens, for the treatment of any macular condition requiring a change of focus. The novel lens is particularly useful for treatment of ARMD. Its function may be visualised by substituting such a lens for the crystalline lens/IOL plus supplementary lens shown in Figures 25, 27, 31 and 33 of US-B-6197057.

### **CLAIMS**

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- 1. An intraocular lens comprising, as one face thereof, a Fresnel prism.
- 2. A composite intraocular lens comprising a lens according to claim 1 and also a material covering said one face, so that the composite lens has a smooth surface.
- 3. A method for the treatment of a macular condition requiring a change of focus, which comprises replacing a patient's crystalline lens by a lens according to claim 1 or claim 2.
- 4. A method according to claim 3, wherein the macular condition is age-10 related macular degeneration.



## INTERNATIONAL SEARCH REPORT

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PCT/GB 02/05360

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### INTERNATIONAL SEARCH REPORT

Box I	Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)
This inte	rnational Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:
1. χ	Claims Nos.: 3,4 because they relate to subject matter not required to be searched by this Authority, namely: Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
2.	Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
з. 🗌	Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).
Box II	Observations where unity of invention is lacking (Continuation of item 2 of first sheet)
This Inte	ernational Searching Authority found multiple inventions in this international application, as follows:
1	As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2.	As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.	As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4.	No required additional search fees were timely paid by the applicant. Consequently, this international Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Remar	it on Protest  The additional search fees were accompanied by the applicant's protest.  No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

In Ional Application No PCT/GB 02/05360

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